

Date: December 4, 2001

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**TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 USC 371**

International Application No.: PCT/NO00/00191  
International Filing Date: June 2, 2000  
First Priority Date Claimed: June 4, 1999  
Application No.: 1999 2739  
Country: NO  
Second Priority Date Claimed: October 21, 1999  
Application No.: 1999 5140  
Country: NO  
Title of Invention: RELEASE MECHANISM IN A MISSILE  
Applicant(s) for DO/EO/US: Hans B. Biserød

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 USC 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 USC 371.
3. ☒ This express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 USC 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 USC 371(c)(2))
  - a) ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b) ☒ has been transmitted by the International Bureau.
  - c) ☐ a copy of Form PCT/1B/308 is enclosed.
  - d) ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 USC 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3))
  - a) ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b) ☐ have been transmitted by the International Bureau.
  - c) ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d) ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 USC 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 USC 371(c)(4)).

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10. (X) A copy of the International Preliminary Examination Report with any annexes thereto, such as any amendments made under PCT Article 34.
11. () A translation of the annexes, such as any amendments made under PCT Article 34, to the International Preliminary Examination Report under PCT Article 36 (35 USC 371(c)(5)).
12. () An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
13. () An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
14. (X) A FIRST preliminary amendment.  
() A SECOND or SUBSEQUENT preliminary amendment.
15. () A substitute specification.
16. () Form PCT/IEPA/401.
17. (X) International Application as published.
18. () The present application qualifies for small entity status under 37 C.F.R. § 1.27.
19. (X) International Search Report.
20. (X) A return prepaid postcard.
21. (X) The following fees are submitted:

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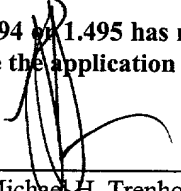
Page 3

				FEES
<b>BASIC FEE</b>				\$1,040
<b>CLAIMS</b>	<b>NUMBER FILED</b>	<b>NUMBER EXTRA</b>	<b>RATE</b>	
Total Claims	14 - 20 =	0 ×	\$18	\$0
Independent Claims	2 - 3 =	0 ×	\$84	\$0
Multiple dependent claims(s) (if applicable)			\$280	\$0
<b>TOTAL OF ABOVE CALCULATIONS</b>				\$1,040
Reduction by 1/2 for filing by small entity (if applicable). Verified Small Entity statement must also be filed. (NOTE 37 CFR 1.9, 1.27, 1.28)				\$
<b>TOTAL NATIONAL FEE</b>				\$1,040
<b>TOTAL FEES ENCLOSED</b>				\$1,040
amount to be refunded:				\$0
amount to be charged:				\$0

22. (X) The fee for later submission of the signed oath or declaration set forth in 37 CFR 1.492(e) will be paid upon submission of the declaration.
23. (X) A check in the amount of \$1,040 to cover the above fees is enclosed.
24. () Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40 per property.
25. (X) The Commissioner is hereby authorized to charge only those additional fees which may be required, now or in the future, to avoid abandonment of the application, or credit any overpayment to Deposit Account No. 11-1410.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

  
Michael H. Trenholm  
Reg. No. 37, 743  
Customer No. 20,995

PROTEC6.001APC

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#3/a

Applicant	:	BISERØD, Hans B.	)	Group Art Unit Unknown
PCT Appl. No.:		PCT/NO00/00191	)	
Filed	:	Herewith	)	
For	:	RELEASE MECHANISM IN A	)	
		MISSILE	)	
Examiner	:	Unknown	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Prior to examination, please amend the above referenced application as follows:

IN THE ABSTRACT:

Please delete the abstract and insert the following amended abstract:

--Abstract of the Disclosure

A release mechanism between a projectile and a rocket motor in a missile. The projectile releases from the rocket motor during flight of the missile when the rocket motor burns out and aerodynamic retardation commences. The front end of the rocket motor comprises a forward closure, a lock retainer received and movable within the forward closure, at least one lock, at least one spring that biases the lock against the lock retainer in a direction opposite the to the direction of motion of the missile. The rear end of the projectile has a central boss surrounded by the forward closure of the rocket motor, wherein the boss comprises recesses or a circumferential groove in which the at least one lock lies and keeps the forward closure and the boss axially together.—

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**IN THE SPECIFICATION:**

Page 1, immediately after the title, please insert –Related Applications This application claims the benefit of the Norwegian applications 1999 2739 filed June 4, 1999 and 1999 5140 filed October 21, 1999 and the international application PCT/NO00/00191 filed June 2, 2000. This application is related to co-pending applications “TRANSLATION AND LOCKING MECHANISM IN A MISSILE” serial number \_\_\_\_\_, attorney docket number PROTEC7.001APC, “RETARDING AND LOCK APPARATUS AND METHOD FOR RETARDATION AND INTERLOCKING OF ELEMENTS” serial number \_\_\_\_\_, attorney docket PROTEC8.001APC, and “PROPELLING DEVICE FOR A PROJECTILE IN A MISSILE” serial number \_\_\_\_\_, attorney docket number PROTEC9.001APC, all filed concurrently herewith. Background of the Invention Field of the Invention--.

Page 1, line 6, please insert –Description of the Related Art--.

Page 1, line 25, please insert –Summary of the Invention--.

Page 2, line 25, please insert –Brief Description of the Drawings--.

Page 3, immediately before line 1, please insert –Detailed Description of the Preferred Embodiments--.

**IN THE CLAIMS:**

Please amend the Claims as follows:

1. (Amended) A release mechanism between a projectile and a rocket motor in a missile, where the projectile is released from the rocket motor during the flight of the missile when the rocket motor is burned out and retardation occurs, wherein the rocket motor in the front end thereof comprises a forward closure, one in the forward closure received and movable lock, at least one lock, at least one spring that biases against the lock retainer in a direction opposite to the direction of travel for the missile, and wherein the projectile in the rear end thereof has a central boss surrounded by the forward closure of the rocket motor, wherein the

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boss comprises recesses or a circumferential groove in which the at least one lock lies and keeps the forward closure and boss axially together.

2. (Amended) The release mechanism of Claim 1, wherein the lock is in the form of a ball.

3. (Amended) The release mechanism of Claim 1, wherein the lock is in the form of a rod, a chip, a lug, or a button.

4. (Amended) The release mechanism of Claim 1, wherein the lock retainer comprises a retaining ring having a continuous internal retainer race.

5. (Amended) The release mechanism of Claim 4, wherein the lock retainer comprises a ball retaining ring having a continuous internal ball retainer race.

6. (Amended) The release mechanism of Claim 1, wherein the lock retainer comprises a number of separated, axially projecting retainers.

7. (Amended) The release mechanism of Claim 6, wherein the lock retainer comprises an annular part and a number of separated, axially projecting ball retainers.

8. (Amended) The release mechanism of Claim 1, wherein the boss is hollow and cylindrical.

9. (Amended) The release mechanism of Claim 1, wherein the forward closure comprises a polar boss and a forward motor closure that are threaded together and a seal interposed therebetween.

10. (Amended) The release mechanism of Claim 1, wherein the projectile is a penetrator.

Please add the following new claims:

11. (New) A missile comprising:

a rocket motor that includes a casing wherein the rocket motor propels the missile;  
a projectile that is coupled to the rocket motor and is separable therefrom; and

a release mechanism interposed between the projectile and the rocket motor wherein the release mechanism includes at least one locking member that is coupled to both the projectile and the rocket motor and a spring biasing member that engages with the at least one locking member so as to maintain the at least one locking member in engagement between the rocket motor and the projectile, wherein the spring biasing member is biased in the direction opposite the motion of the missile such that when the

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rocket motor ceases propelling the missile, the force of the spring biasing member is overcome thereby allowing the locking member to disengage between the projectile and the rocket motor thereby releasing the projectile from the rocket motor.

12. (New) The missile of Claim 11, wherein the release mechanism further comprises a movable locking retainer that engages with the at least one locking member and the spring biasing member such that when the rocket motor disengages the movable locking retainer compresses the spring biasing member thereby permitting the at least one locking member to disengage between the projectile and the rocket motor.

13. (New) The missile of Claim 12, wherein the rocket motor includes one or more recesses in which the at least one locking members are captured, wherein the spring biasing member engages with the movable locking retainer so as to retain the at least one locking members within the recess to secure the projectile and rocket motor together.

14. (New) The missile of Claim 13, wherein the at least one locking member comprises a plurality of balls positioned within the recesses.

#### REMARKS

These changes are being made to bring the subject application into better conformance with U.S. practice, to claim the benefit of previously filed international applications, to identify related and concurrently filed applications, and to more distinctly claim what the Applicant regards as the invention. No new matter is being introduced. Entrance of this amendment is respectfully requested. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 12/04/01

By: 

Michael V. Trenholm  
Registration No. 37, 743  
Attorney of Record  
620 Newport Center Drive  
Sixteenth Floor  
Newport Beach, CA 92660  
(909) 781-9231

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE ABSTRACT:**

[A release mechanism between a projectile (1) and a rocket motor (10) in a missile is disclosed. The projectile (1) releases from the rocket motor (10) during the flight thereof when the rocket motor (10) is burned out and retardation occurs. The front end of the rocket motor (10) comprises a forward closure (7,7), one in the forward closure (7,7) received an movable locking means retainer (2), at least one locking means (3), at least one spring means (6) that bias against the locking means retainer (2) in a direction opposite to the direction of motion for the missile. The rear end of the projectile (1) has a central boss (4) surrounded by said forward closure (7,7) of the rocket motor (10), where the boss (4) comprises recesses or a circumferential groove (14) in which the at least one locking means (3) is lying and keeps the forward closure (7,7) and boss (4) axially together.

**--Abstract of the Disclosure**

A release mechanism between a projectile and a rocket motor in a missile. The projectile releases from the rocket motor during flight of the missile when the rocket motor burns out and aerodynamic retardation commences. The front end of the rocket motor comprises a forward closure, a lock retainer received and movable within the forward closure, at least one lock, at least one spring that biases the lock against the lock retainer in a direction opposite the to the direction of motion of the missile. The rear end of the projectile has a central boss surrounded by the forward closure of the rocket motor, wherein the boss comprises recesses or a circumferential groove in which the at least one lock lies and keeps the forward closure and the boss axially together.—

**IN THE SPECIFICATION:**

Page 1, immediately after the title, please insert —**Related Applications** This application claims the benefit of the Norwegian applications 1999 2739 filed June 4, 1999 and 1999 5140 filed October 21, 1999 and the international application PCT/NO00/00191 filed June 2, 2000. This application is related to co-pending applications “TRANSLATION AND LOCKING MECHANISM IN A MISSILE” serial number \_\_\_\_\_, attorney docket number PROTEC7.001APC, “RETARDING AND LOCK APPARATUS AND METHOD FOR



PCT Appl. No. : PCT/NO00/00191

Filed : Herewith

RETARDATION AND INTERLOCKING OF ELEMENTS" serial number \_\_\_\_\_, attorney docket PROTEC8.001APC, and "PROPELLING DEVICE FOR A PROJECTILE IN A MISSILE" serial number \_\_\_\_\_, attorney docket number PROTEC9.001APC, all filed concurrently herewith. Background of the Invention Field of the Invention--.

Page 1, line 6, please insert --Description of the Related Art--.

Page 1, line 25, please insert --Summary of the Invention--.

Page 2, line 25, please insert --Brief Description of the Drawings--.

Page 3, immediately before line 1, please insert --Detailed Description of the Preferred Embodiments--.

#### IN THE CLAIMS:

Please amend the Claims as follows:

1. (Amended) A release mechanism between a projectile [(1)] and a rocket motor [(10)] in a missile, where the projectile [(1)] is released from the rocket motor [(10)] during the flight [thereof] **of the missile** when the rocket motor [(10)] is burned out and retardation occurs, [characterized in that] **wherein** the rocket motor [(10)] in the front end thereof comprises a forward closure [(7, 7')] , one in the forward closure [(7, 7')] received and movable lock[ing means] retainer (2)], at least one lock[ing means (3)], at least one spring [means (6)] that biases against the lock[ing means] retainer [(2)] in a direction opposite to the direction of travel for the missile, and [that] **wherein** the projectile [(1)] in the rear end thereof has a central boss [(4)] surrounded by [said] **the** forward closure [(7, 7')] of the rocket motor [(10)], **wherein** the boss [(4)] comprises recesses or a circumferential groove [(14)] in which the at least one lock[ing means (3) is lying] **lies** and keeps the forward closure [(7, 7')] and boss [(4)] axially together.

2. (Amended) [A release mechanism according to claim 1, characterized in that] **The release mechanism of Claim 1, wherein** the lock[ing means (3)] is in the form of a ball.

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3. (Amended) [A release mechanism according to claim 1, characterized in that] **The release mechanism of Claim 1, wherein the lock[ing means (3)] is in the form of a rod, a chip, a lug, or a button.**

4. (Amended) [A release mechanism according to any of the claims 1, 2, or 3, characterized in that] **The release mechanism of Claim 1, wherein the lock[ing means] retainer [(2) is] comprises a retaining ring having a continuous internal retainer race.**

5. (Amended) [A release mechanism according to claim 4, characterized in that] **The release mechanism of Claim 4, wherein the lock[ing means] retainer [(2) is] comprises a ball retaining ring having a continuous internal ball retainer race.**

6. (Amended) [A release mechanism according to any of the claims 1, 2, or 3, characterized in that] **The release mechanism of Claim 1, wherein the lock[ing means] retainer [(2) is] comprises a number of separated, axially projecting retainers [(16)].**

7. (Amended) [A release mechanism according to claim 6, characterized in that] **The release mechanism of Claim 6, wherein the lock[ing means] retainer [(2)] comprises an annular part [(15)] and a number of separated, axially projecting ball retainers [(16)].**

8. (Amended) [A release mechanism according to any of the claims 1-7, characterized in that] **The release mechanism of Claim 1, wherein the boss [(4)] is hollow and cylindrical.**

9. (Amended) [A release mechanism according to any of the claims 1-8, characterized in that] **The release mechanism of Claim 1, wherein the forward closure [(7, 7')] is assembled of] comprises a polar boss [(7)] and a forward motor closure [(7')] that are threaded together and [with] a seal [(18)] interposed therebetween.**

10. (Amended) [A release mechanism according to any of the claims 1-8, characterized in that] **The release mechanism of Claim 1, wherein the projectile [(1)] is a penetrator.**

Please add the following new claims:

11. (New) A missile comprising:

a rocket motor that includes a casing wherein the rocket motor propels the missile;

a projectile that is coupled to the rocket motor and is separable therefrom; and

a release mechanism interposed between the projectile and the rocket motor wherein the release mechanism includes at least one locking member that is coupled to both the projectile and the rocket motor and a spring biasing member that engages with

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Filed : Herewith

the at least one locking member so as to maintain the at least one locking member in engagement between the rocket motor and the projectile, wherein the spring biasing member is biased in the direction opposite the motion of the missile such that when the rocket motor ceases propelling the missile, the force of the spring biasing member is overcome thereby allowing the locking member to disengage between the projectile and the rocket motor thereby releasing the projectile from the rocket motor.

12. (New) The missile of Claim 11, wherein the release mechanism further comprises a movable locking retainer that engages with the at least one locking member and the spring biasing member such that when the rocket motor disengages the movable locking retainer compresses the spring biasing member thereby permitting the at least one locking member to disengage between the projectile and the rocket motor.

13. (New) The missile of Claim 12, wherein the rocket motor includes one or more recesses in which the at least one locking members are captured, wherein the spring biasing member engages with the movable locking retainer so as to retain the at least one locking members within the recess to secure the projectile and rocket motor together.

14. (New) The missile of Claim 13, wherein the at least one locking member comprises a plurality of balls positioned within the recesses.

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## RELEASE MECHANISM IN MISSILE

The present invention relates to a release mechanism between a projectile and a rocket motor in a missile, where the projectile releases from the rocket motor during the flight thereof when the rocket motor is burned out and retardation occurs.

The release mechanism according to the invention is developed for use in missiles, and in particular, but not exclusively, in rocket accelerated penetrators. Rocket accelerated penetrators are often kept in their storing and standby state with the main parts thereof not assembled. This means that the part having control fins, the fin cone, and the rocket motor proper is assembled to the penetrator at the moment before the missile is launched from the launcher. The penetrator, which is in form of an arrow like body having substantial mass, is lying in standby position in a translation tube within the rocket motor and with the pointed end thereof supported in the control fin part. How the assembly operation happens is more detailed described in the priority founding Norwegian patent application no. 19992739.

During launching preparations the penetrator is translated through the translation tube and the control fin part, and the rear end of the penetrator is interlocked to the control fin part immediately before the rocket motor is ignited. It is common practise that the rocket motor is separated from the penetrator during the flight thereof as soon as the rocket motor is burned out and has lost its propelling force. It is the mechanism for this separation between the penetrator, and more generally the projectile, and the rocket motor the present application deal with.

According to the invention, a release mechanism of the introductorily described kind is provided, which is distinguished in that the rocket motor in the front end thereof comprises a forward closure, one in the forward closure received and movable locking means retainer, at least one locking means, at least one spring means that acts against the locking means retainer in a direction opposite to the direction of motion for the missile, and that the projectile in the rear end thereof has a central boss surrounded by said forward closure of the rocket motor, where the boss comprises recesses or a circumferential groove in which the at least one locking means is lying and keeps the forward closure and boss axially together.

As a practical and convenient embodiment of the invention, the locking means is in form of a ball. However, one acknowledges that the locking means may appear in form of a rod, a chip, a lug, a button or the like.

- 5 In one embodiment the locking means retainer can be a retaining ring having continuous internal retainer race. Optionally, the retaining ring can have a number of axially projecting locking means retainers, such like ball retainers. Preferably, the central boss is hollow cylindrical. In order to facilitate the manufacture and assembly of the forward closure of the rocket motor, the forward closure may advantageously be assembled of  
10 several components.

It is to be understood that the release mechanism is activated as soon as the rocket motor is burnt out and retardation of the missile occurs. This retardation activates the ball retainer ring, which, due to the inertia thereof, moves forward against the spring  
15 means and depresses the spring means. By the relative forward motion of the ball retainer ring in respect of the boss on the projectile and the balls, the balls are released radially outwards such that the balls can pass out of the recesses or the groove. Thus the locking between the forward closure and the boss ceases, and the penetrator, or the projectile, separates from the rocket motor.

20

Other and further objects, features and advantages will appear from the following description of one for the time being preferred embodiment of the invention, which is given for the purpose of description, without thereby being limiting, and given in context with the appended drawings where:

25

- Fig.1 shows schematically a rocket accelerated penetrator,  
Fig.2 shows the front end of a penetrator in the storing position thereof inside a control fin part and a rocket motor,  
Fig.3 shows the rear end of a translated penetrator after the penetrator has been  
30 interlocked to a control fin part and a rocket motor,  
Fig.4 shows schematically and in exploded view the rocket accelerated penetrator, and  
Fig.5 shows one embodiment of the locking means retainer.

The description is related to a missile in form of a penetrator and a rocket motor, but the invention is not limited to a penetrator only. Any projectile, with or without warhead, can together with a rocket motor use the release mechanism according to the invention.

5 We firstly refer to fig.1 that illustrates a missile in flight. The missile comprises a penetrator 1, a control fin part 5 and a rocket motor 10 as main components. The penetrator 1 is an arrow like body having substantial mass, preferably of tungsten or depleted uranium. A penetrator is a projectile omit warhead and do achieve its destructive effect owing to the kinetic energy thereof.

10 Fig.2 shows the forward pointed end of the penetrator 1 in the way it is lying in standby position in the control fin part 5 and within a translation tube 12 centrally located in the rocket motor 10 during storage until launching, or ready for launching from a launching pipe or launcher (not shown). Fig.2 is, however, a preliminary and incomplete drawing  
15 in respect of the components that are included in the release mechanism according to the invention and the finite embodiment is described in context with fig.3 and 4 below.

The penetrator 1 is held axially in place within the rocket motor 10 by a closure means (not shown) having a cap that can be opened or burst away.

20 The reference number 8 refers to one of four control fins that are located circumferentially about a centre and having equal pitch or angular distance from each other. The number of fins 8 can vary according to desire. The rocket motor 10 is, as mentioned, releasable fixed to the control fin part 5. The rocket motor 10 is released and  
25 does separate from the control fin part 5 during the flight of the missile when a powder charge within the rocket motor 10 is burned out and retardation occur.

The propulsion means for translation of the projectile through the translation tube within the rocket motor is described in closer detail in copending Norwegian patent  
30 application no. 19995142. The mechanism for translation of the projectile and subsequent locking to the rocket motor is described in closer detail in copending Norwegian patent application no. 19995141.

Fig.3 shows the rear end of the penetrator 1 when the penetrator is translated through  
35 the control fin part 5. The rear end of the penetrator 1 interlocks to the control fin part 5

after this translation. How this happen is described in closer detail in Norwegian patent application no. 19992739.

The front end of the rocket motor 10 is basically mounted to the control fin part 5 by means of the release mechanism according to the invention. The connection between the control fin part 5 and the front end of the rocket motor 10 occurs via a boss 4 in form of a tubular and rearwards directed extension of the rear and central end of the control fin part 5. The boss 4 does either have a number of recesses 14 (as clearly shown in fig.4) or a circumferential groove (not shown), which receive a number of balls 3. The recesses 14, or the groove, are adapted to the configuration and dimension of the balls 3.

The front end of the rocket motor 10 form a forward closure that includes a forward polar boss 7, to which the outer shell of the rocket motor 10 is fixed, and a forward motor closure 7'. The forward motor closure 7' is threaded into the polar boss 7 via a thread connection 17 and a seal 18, in form of an O-ring, is located between the boss 7 and the motor closure 7'. The motor closure 7' has an internal forward extending tubular part 7'' that is an integrated part of the motor closure 7'. The motor closure 7' does also have a rearward extending and conical configured pipe piece 7''' that supports and fixates the translation tube 12.

The motor closure 7' surrounds the boss 4 of the control fin part 5 and the balls 3. A ball retainer ring 2 is received in the motor closure 7' and is initially located such that the retainer ring 2 encloses the balls 3 and keeps the balls 3 radially and axially in place in their respective recesses 14. The balls 3 thus act as the locking connection between the control fin part 5 and the rocket motor 10. The ball retainer ring 2 is axially slideable and is biased by a spring means 6 in a direction opposite to the direction of movement for the missile. The spring means 6 can be one or more coil springs, Belleville springs or per se any kind of spring means able to perform the intended function. In the opposite end the spring means 6 abut against an end cap 13, which is fixedly threaded to the motor closure 7'. The material of the tubular part 7'' is of a certain thickness. The total amount of the thickness of the tubular part 7'' and the depth of the recesses 14 must be less than the radius of the ball 3.

Fig.4 shows the missile with the parts apart. After that the release mechanism has performed the mission thereof, it is the penetrator 1 and the control fin part 5 that

continue the flight while the remaining parts are falling off. The reference number 11 shows an ogive that serves as a flow element in the transition between the control fins 8 and the front end of the rocket motor 10. The ogive 11 also restrict relative rotation between the penetrator 1 and the rocket motor 10. After the rocket motor 10 is burnt out, the ogive has carried out its mission and does release from the control fin part 5 together with the rocket motor 10, the polar boss 7, the motor closure 7', the spring or springs 6, the ball retainer ring 2, the balls 3 and a propulsion piston 9 for translation of the penetrator 1 within the rocket motor 10.

As mentioned introductorily does the release mechanism come into force as soon as the rocket motor 10 is burnt out and retardation of the missile occurs. This retardation activates the ball retainer ring 2, which, due to the inertia thereof, moves forward against the springs 6 and compresses the springs 6. By the relative motion forward of the ball retainer ring 2 in respect of the boss 4 on the projectile 1 and the balls 3, the balls 3 are released radially outwards such that the balls can pass out of the recesses 14. When the balls 3 not any longer are axially retained, the motor closure 7' will move axially in respect of the boss 4 and the boss 4 will thus push the balls 3 out of the recesses 14. Thus the locking between the motor closure 7' and the boss 4 ceases and the rocket motor 10 does part from the penetrator 1 or projectile. If the missile is of the kind that rotates about its own axis, the rotation will provide centrifugal forces to the balls 3 that contribute to additional force in outwards radial direction.

In fig.4 is the ball retainer ring 2 shown in an embodiment having a circumferential continuous ball retainer race in the same way as an outer race in a ball bearing.

Fig.5 shows an alternative embodiment of a ball retainer ring 2'. Four ball retainers 16 project in an axial direction out from an annular part 15. The number of ball retainers 16 can vary according to need. As in the first embodiment, the boss 4 can have an external circumferential groove adapted to the dimension of the balls 3, or a number of recesses 14 adapted to the dimension of the balls 3 and correspond with the number of balls 3, as illustrated in fig.4.

In the drawings balls 3 are shown as the locking means. Even if balls are preferred, it will be possible to use locking means in form of rods, chips, lugs, buttons etc. It will also be possible to provide a spring underneath the locking means that inherently bias



the locking means radially outwards and is released when the retainer for the locking means moves axially forward.

177. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 8

P a t e n t   c l a i m s

1.

A release mechanism between a projectile (1) and a rocket motor (10) in a missile,  
5 where the projectile (1) is released from the rocket motor (10) during the flight thereof  
when the rocket motor (10) is burned out and retardation occurs, c h a r a c -  
t e r i s e d i n that the rocket motor (10) in the front end thereof comprises  
a forward closure (7,7'), one in the forward closure (7,7') received and movable locking  
means retainer (2), at least one locking means (3), at least one spring means (6) that bias  
10 against the locking means retainer (2) in a direction opposite to the direction of motion  
for the missile, and that the projectile (1) in the rear end thereof has a central boss (4)  
surrounded by said forward closure (7,7') of the rocket motor (10), where the boss (4)  
comprises recesses or a circumferential groove (14) in which the at least one locking  
means (3) is lying and keeps the forward closure (7,7') and boss (4) axially together.

15

2.

A release mechanism according to claim 1, c h a r a c t e r i s e d  
i n that the locking means (3) is in form of a ball.

20 3.

A release mechanism according to claim 1, c h a r a c t e r i s e d  
i n that the locking means (3) is in form of a rod, a chip, a lug or button.

4.

25 A release mechanism according to any of the claims 1, 2 or 3, c h a r a c -  
t e r i s e d i n that the locking means retainer (2) is a retaining ring having  
continuous internal retainer race.

5.

30 A release mechanism according to claim 4, c h a r a c t e r i s e d  
i n that the locking means retainer (2) is a ball retaining ring having continuous  
internal ball retainer race.

35

6.

A release mechanism according to any of the claims 1, 2 or 3, characterised in that the locking means retainer (2) has a number of separated, axially projecting retainers (16).

5

7.

A release mechanism according to claim 6, characterised in that the locking means retainer (2) comprises an annular part (15) and a number of separated, axially projecting ball retainers (16).

10

8.

A release mechanism according to any of the claims 1-7, characterised in that the boss (4) is hollow cylindrical.

15

9.

A release mechanism according to any of the claims 1-8, characterised in that the forward closure (7,7') is assembled of a polar boss (7) and a forward motor closure (7') that are threaded together and with a seal (18) there between.

20

10.

A release mechanism according to any of the claims 1-9, characterised in that the projectile (1) is a penetrator.

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(19) World Intellectual Property Organization  
International Bureau



INTERNATIONAL PATENT COOPERATION TREATY (PCT)

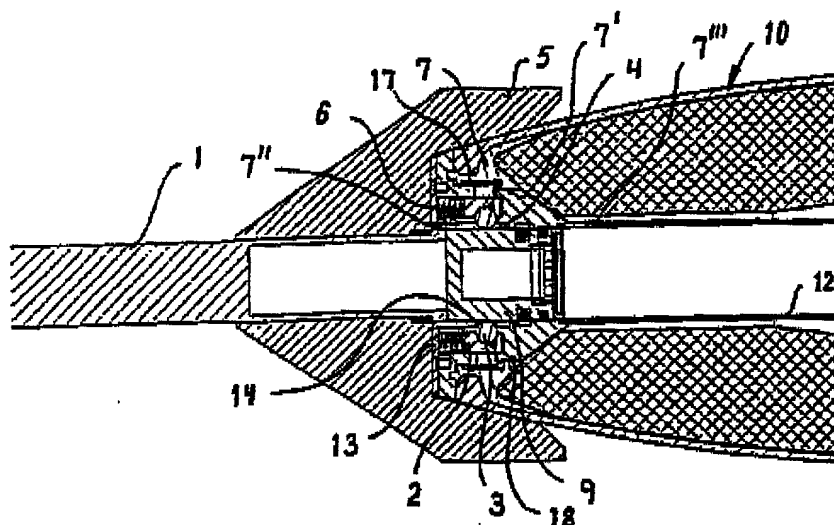
(43) International Publication Date  
14 December 2000 (14.12.2000)

PCT

(10) International Publication Number  
WO 00/75601 A1

- (51) International Patent Classification: F42B 15/36 // 15/00
- (21) International Application Number: PCT/NO00/00191
- (22) International Filing Date: 2 June 2000 (02.06.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
19992739 4 June 1999 (04.06.1999) NO  
19995140 21 October 1999 (21.10.1999) NO
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- (72) Inventor; and  
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: RELEASE MECHANISM IN MISSILE



(57) Abstract: A release mechanism between a projectile (1) and a rocket motor (10) in a missile is disclosed. The projectile (1) releases from the rocket motor (10) during the flight thereof when the rocket motor (10) is burned out and retardation occurs. The front end of the rocket motor (10) comprises a forward closure (7,7'), one in the forward closure (7,7') received and movable locking means retainer (2), at least one locking means (3), at least one spring means (6) that bias against the locking means retainer (2) in a direction opposite to the direction of motion for the missile. The rear end of the projectile (1) has a central boss (4) surrounded by said forward closure (7,7') of the rocket motor (10), where the boss (4) comprises recesses or a circumferential groove (14) in which the at least one locking means (3) is lying and keeps the forward closure (7,7') and boss (4) axially together.

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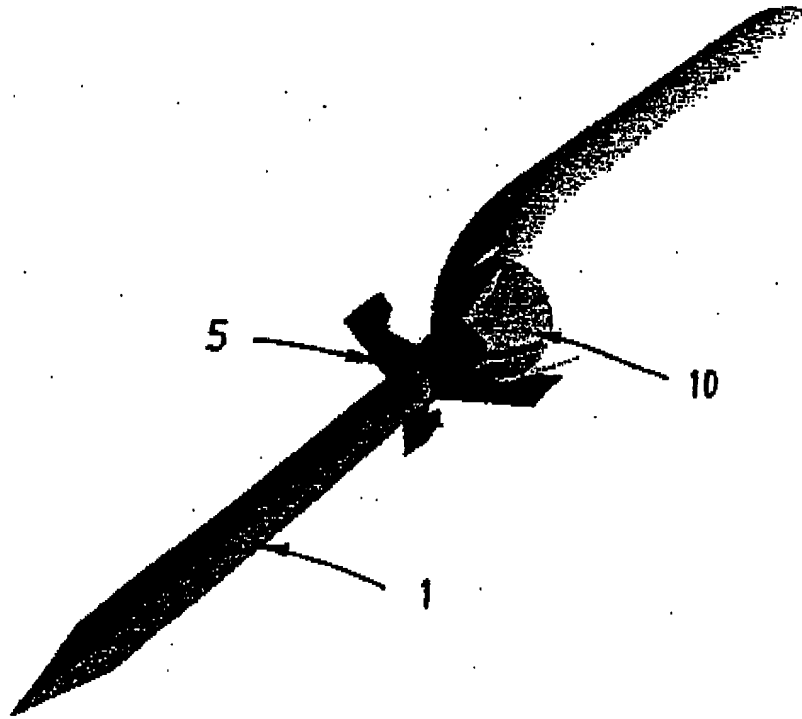


Fig. 1.

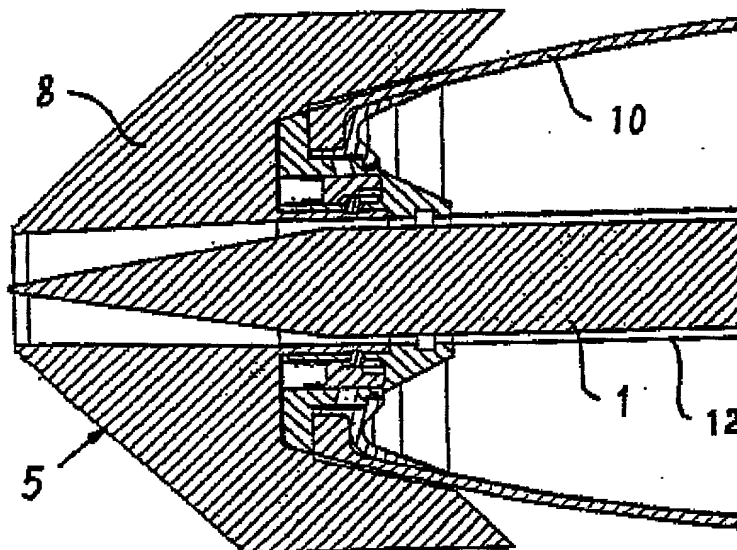


Fig. 2.

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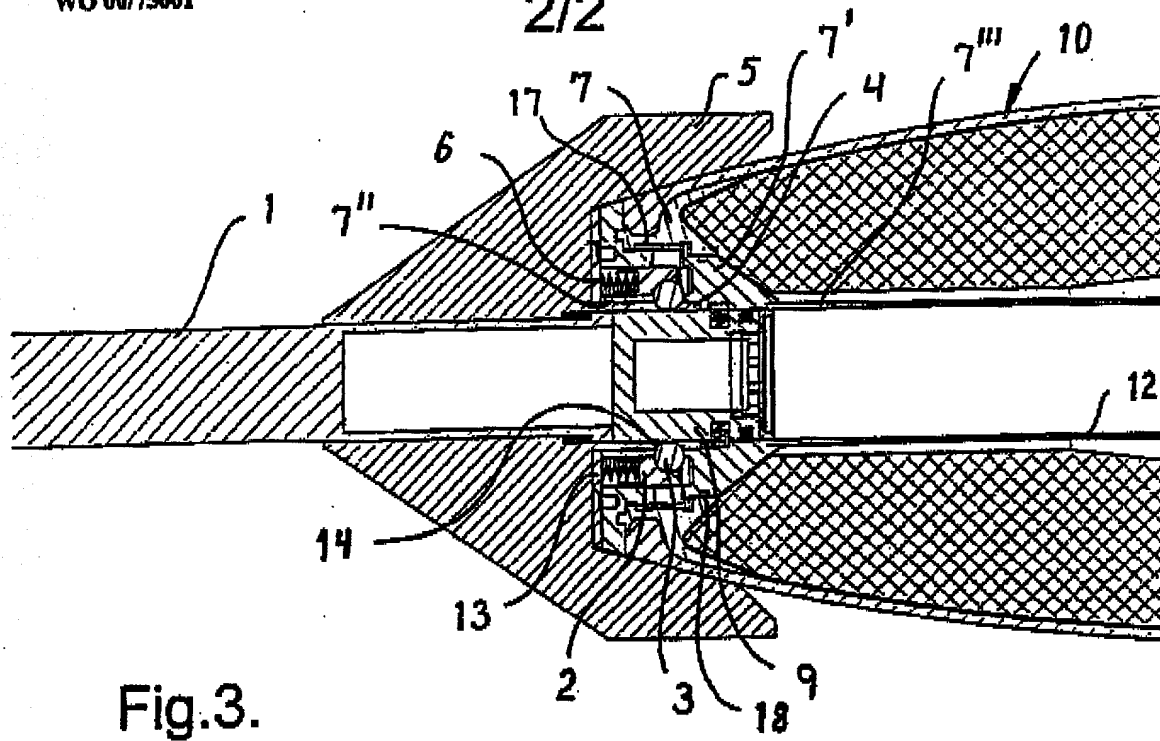


Fig.3.

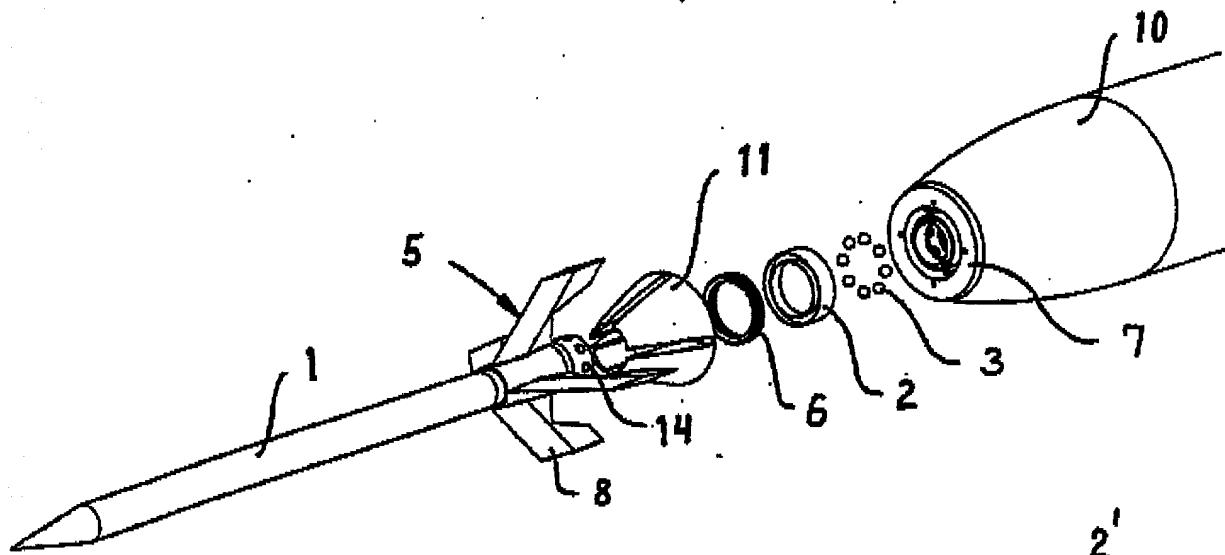


Fig.4.

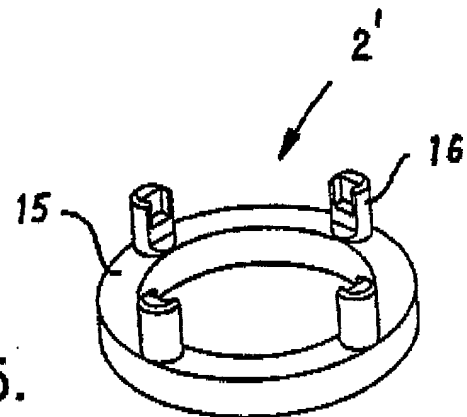
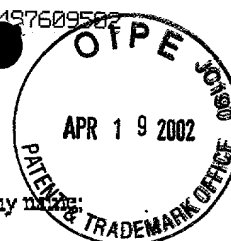


Fig.5.

PROTEC6.001APC

## DECLARATION - USA PATENT APPLICATION



#5

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled RELEASE MECHANISM IN A MISSILE  
the specification of which:

- (a) ☐ is attached hereto; or
- (b) ☒ was filed on December 04, 2001 as Application No. 10/009281 or Express Mail No., as Application No. not yet known \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable); or
- (c) ☐ was described and claimed in PCT International Application No. \_\_\_\_\_ filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_ (if any) and/or under PCT Article 34 on \_\_\_\_\_ (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above;

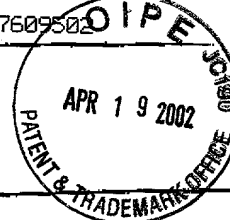
I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56;

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent, design or inventor's certificate or any PCT international application(s) listed below and have also identified below any foreign application(s) for patent, design or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed for the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

| COUNTRY (OR INDICATE IF PCT) | APPLICATION NUMBER | DATE OF FILING (day, month, year) | PRIORITY CLAIMED UNDER 37 U.S.C. § 119 |                          |
|------------------------------|--------------------|-----------------------------------|--|--------------------------|
| Norway                       | 1999 2739          | June 04, 1999                     | X YES                                  | NO <input type="radio"/> |
| Norway                       | 1999 5140          | October 21, 1999                  | X YES                                  | NO <input type="radio"/> |
| PCT                          | PCT/NO00/00191     | June 2, 2000                      | X YES                                  | NO <input type="radio"/> |
|                              |                    |                                   | <input type="radio"/> YES              | NO <input type="radio"/> |
|                              |                    |                                   | <input type="radio"/> YES              | NO <input type="radio"/> |

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below, and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:



Prior U.S.A. Application(s)

Application No.: 10/009281 Filing Date: Dec. 04, 2001 Status: \_\_\_\_\_

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of the application or any patent issued thereon.

1-00 Full name of sole or first inventor: Hans R. Biserad

Inventor's signature [Signature] Day 05 Month 04 Year 2002

Residence (city and country): Grimsrudvn. 9. 2830 Raufoss, Norway NOR

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